This affects all those involved with the use of containers as a means of moving goods from A to B

Summary
The use of containers makes global shipping of goods straightforward, but for the system to work efficiently all stakeholders have to accept a certain degree of responsibility which at present does not always happen. This briefing note considers the following.

• Examples of incidents involving collapse of container stacks
• The ICS/WSC safety guidelines and issues arising
• Existing guidance on load restraint
• Vehicles on ferries
• Management responsibilities regarding loading containers
• Security of items inside containers
• Conclusions and recommendations

Background
Shipping is a core mode of transport and, with aviation, the most international of transport sectors, ensuring global trade and continuing supplies of vital raw materials and energy. The need for EU stakeholders to take an interest in how shipping supply chains operate becomes even more obvious when considering some key figures.

• Shipping carries nearly 90 per cent of European external trade
• European companies and residents currently own about 40 per cent of the world’s shipping fleet
• About 25 per cent of the world fleet flies a European flag

Examples of incidents involving collapse of container stacks
In 2007, the vessel ‘Annabella’ experienced a collapse of seven containers. A second incident involving a much larger vessel, the ‘Napoli’ led to the publication of a best practice guide ‘Safe Transport of Containers by Sea – Guidelines on Best Practices’ compiled by a working group drawn from the International Chamber of Shipping (ICS) and the World Shipping Council (WSC). The guide identified various failings and made recommendations to those involved in maritime transport supply chains. (For more case studies see box on page 2.)

The ICS/WSC safety guidelines and issues arising
The ICS/WSC working group concluded that the party stuffing the container was especially responsible for ensuring that it was not overloaded and that its gross weight was correctly recorded on shipping documents. Encouragingly, the ICS/WSC guidelines reflected the good practices that were already undertaken by the vast majority of responsible companies in the industry, but agreed that the overloading of containers was never acceptable and that the following points were fundamental to safety.

• Those involved with the correct packing, labelling and weighing of freight had a significant responsibility, as did those involved in the safe handling and stowage of containers when loaded on board a ship
• Terminal operators should verify the weights of arriving containers before they were loaded on to vessels
• Containers should be inspected for damage and properly maintained as required

Unfortunately, as is so often the case, best practice and common sense have not transferred to the real world. A reading of Marine Accident Investigation Branch (MAIB) reports compiled over many years suggests that shippers frequently fail to make accurate container weight declarations, probably for many different reasons including lack of knowledge and the desire to obtain a cheaper transport rate.

Port issues
Large ports such as Felixstowe and Southampton handle thousands of
Case studies

Annabella
A container stack collapsed as a result of downward compression acting on the lower containers of the stack, which were not strong enough to support those above. The maximum allowable stack weight of the containers had been exceeded (actual weight 225 tonnes against a permissible stack weight of 116 tonnes) and no lashing bars had been applied to them. Findings included:

- the Marine Accident Investigation Branch (MAIB) considered that there were shortcomings in the flow of information relating to container stowage between the various parties involved
- the pace of modern container operations was such that it became very difficult for the ship’s staff to maintain control of the loading plan
- containers that had an allowable stacking weight below the ISO standard should have been clearly marked by appropriate marking and coding

Husky Racer
The incident involving this container feeder vessel occurred in October 2009. Eighteen containers were lost overboard during unloading. Key factors included:

- top containers in seven of the nine stacks which were shown on the ship’s loading plan as empty, actually had contents ranging between 15 and 30 tonnes
- the incorrect weights were shown on the loading plan because of a system shortcoming which did not update the operations department when the shipper provided additional, more accurate contents details to the carrier

Riverdance
On 31 January 2008, the ro-ro cargo vessel Riverdance grounded on the coast of Lancashire. The investigation into the incident reported the main causes to include:

- the true weights and disposition of the vessel’s cargo were not known
- the stability of Riverdance was not calculated before departure. Vehicles/trailers shifted once the sea became rougher and the vessel’s rolling increased
- the vessel sustained a series of large rolls which caused additional trailers and their contents to shift
- because the disposition of the weights on board the vessel was unknown, the amount of ballast transferred was based on the master’s estimate
- shore-based staff did not have access to accurate stability information. Had this been available, they would have been able to provide better support to the master

Containers on a daily basis and claim they cannot weigh every box entering the port. The reasoning given is that having to deal separately with the moving, storage and processing of overweight boxes, or those containing seriously unbalanced cargoes, slows down the productivity and efficient operation of the port.

On the other hand, manufacturers of modern cranes and other box-handling equipment advise that their products are able to speed up processes dramatically and can weigh boxes automatically during handling.

Haulier issues
Road freight operators have two principal issues to deal with arising from misdeclared container weights. These are:

- axle and gross weight overloads on the vehicle itself
- weight distribution/load security within the container(s)

For years hauliers and their drivers have been aware that the containers they are moving from ports for UK delivery may be jeopardising road safety due to their being overweight. Drivers have no way of knowing that weights reported on their collection notes are accurate unless they can arrange for a re-weigh. Hauliers have to take on trust the gross container weight as advised by shippers or consignors, and which the case studies demonstrate may be misdeclared.

Loads shifting on goods vehicles carrying containers are a problem that can lead to vehicle rollover and a variety of serious consequences, not the least of which is insurance cover being declared null and void. The consequences of load shift could vary from a few damaged boxes with no resulting personal injury to an hgv rollover causing a fatal accident.

Whenever practicable, hauliers should carry out risk assessments to influence their thinking on how particular loads should be restrained. A consideration of
Loading containers: implications for shippers, forwarders and hauliers

Consequences of misdeclared container weights

- Container stacks collapsing in ports while awaiting loading or during handling
- Container stacks collapsing on board ships
- Risk of serious injury to stevedores or sea-going staff due to the above
- Risk of pollution damage due to contents of containers spilling into the sea

All the possible scenarios and outcomes, together with adherence to safe loading principles and use of appropriate restraint devices, is the best way to ensure that freight carried in containers will remain in place and that an unsafe load situation does not develop during any journey.

Forces experienced by loads in the marine environment are much greater than those experienced by cargoes in containers during road and rail journeys. If containers were stuffed to avoid overloading and cargoes properly restrained to suit possible maritime conditions there would be fewer incidents to jeopardise the day-to-day activities of the truck or train operator.

Rail issues

Train companies have similar concerns to their road industry colleagues: the most critical factor in train operations is the planned distribution of weight. Incorrect weight distribution in a container can cause the lighter end of the rail wagon to lift and possibly derail the train. A train that has exceeded its gross trailing weight due to incorrect weight declarations could find itself underpowered and grind to a halt, causing severe delays on a main line and incurring massive costs per minute for each train delayed.

The force required to brake a train in a given distance is calculated using the known cargo weight in relation to train speed. If the final weight of the train has been calculated using inaccurate container weights then the brake force information will be incorrect and it will take longer to brake the train than expected. This could have catastrophic consequences. Finally, each rail route has a maximum weight that can be sustained on bridges and structures. If this weight is exceeded there is the potential for a bridge collapse.

Existing guidance on load restraint

There is no shortage of advice on how to restrain cargoes in vehicles (or in containers being transported by them). Guidance already exists via a number of officially recognised standards, codes of practice and industry publications.

There are two standards of load securing recognised in the European Union, firstly, guidelines recommended by IMO/ILO/UNECE on the packing of cargo transport units — which is generally accepted and is a globally recognised resource, and, secondly, those recommended by EN Standard 12 195-1. The IMO method is calculated using ‘static friction’ and the EN standard uses ‘dynamic friction’.

In April 2010, a revised standard EN 12 195-1:2010 was adopted in an attempt to harmonise cargo securing among all CEN members, which means that it will be made mandatory or voluntary according to the national legislation of individual states. This compromise settlement reduces the differences between the two standards and will hopefully minimise the chances of truck operators having fines imposed upon them for insecure loads.

Guidance may also be found in the Department for Transport (DfT) Code of Practice publication ‘Safety of loads on vehicles’ (2002). Inter alia it identifies that “drivers should be aware of the additional risk of the load, or part of the load, moving when the vehicle is being driven” and that this applies to all vehicles and all types of cargo. It reminds us that the driver is also ultimately responsible for the cargo carried on the vehicle whether

Cost of recovery if boxes lost in coastal waters
Cost of repairs to vessel, ship downtime etc
Higher insurance premiums to cover cargo and environmental claims

Stack collapses are the biggest risk from misdeclared containers for large ships. For smaller vessels their stability can be compromised and in stormy conditions, ultimately a capsize is a real possibility.

3 British Standard BS EN 12 195 – concerning load restraint assemblies on road vehicles. The standard deals with a variety of topics including calculation of lashing forces necessary to restrain various cargoes on different types of vehicle and modes of transport, safety requirements for web lashings, lashing chains and use of steel wire ropes etc
4 CEN – The European Committee for Standardisation
Key points for personnel loading vehicles or containers

- Observe the payload limits for different types of container
- Observe the appropriate sea freight regulations regarding maximum box weight
- The weight regulations relevant to road and rail transport in the countries through which the container will travel must be complied with
- Ensure load is distributed as evenly as possible throughout the box to minimise danger to handling staff

or not they were involved in its packing and restraint.

The Code of Practice goes on to set out practical advice, principles and guidance on how to restrain cargo on vehicles, providing technical understanding on the choice of vehicle, arrangement of cargo, anchor points, headboards and partitioning. It also considers the application and usefulness of different types of cargo restraint available including lashings, sheeting, netting, dunnage and friction.

The European Commission’s ‘Best Practice Guidelines on Cargo Securing’ published in 2004 offers similar guidance to that contained in the DfT Code, providing practical advice and instructions to all personnel involved in the loading and unloading of cargo and details methods and techniques for its restraint.

Although both these guides address road transport issues, it must be remembered that it is not possible to provide specific advice on the restraint of every type of cargo because of the sheer variety of freight which may be carried. However, there is sufficient experience available to provide best practice principles that may in some instances be applied to specific cargo types carried in containers. Examples may be found in the above panel.

Vehicles on ferries

It is important for road freight operators to bear in mind that when a vehicle is carried on a ship, as in ro-ro ferry operations, the vehicle and its load will be subject to different forces to those experienced by normal road-going activities. A restraint system that is suitable for road use is unlikely to be adequate at sea.

Questions surrounding weighing are also being asked in the ro-ro sector. As the MAIB pointed out in the Riverdance report, there is currently no legal requirement to weigh trailers before embarkation. Ro-ro vessels frequently sail with insufficient detail about the containers or trailers on board, which are often loaded at the last minute.

Any vehicle intended for the carriage of cargo by ship should be in sound structural condition and have an adequate number of securing points of sufficient strength to ensure that it can be satisfactorily secured to the deck. The securing points should be easily accessible to deck crew and not obstructed by fuel tanks, batteries etc.

The table shows the minimum number of securing rings required against the gross vehicle mass (gvm). For motor vehicles and drawbar trailers, the table applies to the motor vehicle and trailer, respectively.

Tractor units are excluded from the table. They should have two securing points at the front of the vehicle; alternatively a towing coupling at the front will suffice.

<table>
<thead>
<tr>
<th>Gross vehicle mass – tonnes</th>
<th>Minimum number of securing rings on each side of the vehicle</th>
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<tbody>
<tr>
<td>3.5t&lt;20t</td>
<td>2</td>
</tr>
<tr>
<td>20t&lt; 30t</td>
<td>3</td>
</tr>
<tr>
<td>30t&lt; 40t</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: MCA

Lashing should be done in such a way as to prevent sliding or tipping over. In addition, there should be sufficient securing points within the container or vehicle.
Loading best practice – top tips

- Heavier cargo should be placed as low down in the container as possible
- Heavier cargo should be placed towards the centre line of the container and lighter items along the sides
- Items should be spread over the floor as evenly as possible in order to avoid axle overloading issues during the road leg of the container’s journey
- Dunnage\(^5\) may be used to fill spaces between items of cargo or between cargo and the interior walls in order to reduce the amount of possible movement of the cargo. It can also be used to stabilise cargo that has already been restrained by using straps or tethers
- Package smaller items together into a single mass item, for example, shrink wrapped on to a pallet. This makes for easier handling and restraint of the item in the container
- Large items such as vehicles or tree trunks present greater difficulties which are likely to require specially-engineered solutions to properly restrain them

Management responsibilities regarding loading containers

Companies employing staff to load containers or vehicles must be mindful of their responsibilities under a wide variety of legislation including, for example, health and safety at work, construction and use regulations and the provisions of the Road Traffic Act, among others. The legislation applies to both own employees and others in the vicinity of the vehicle. Hence the necessity to ensure that loads are properly restrained and the vehicle carrying them is legal and roadworthy.

Management should:

- ensure adequate training is available to their loading staff on the choice of restraints available and how and when to use them
- carry out periodic checks to ensure cargoes are being restrained adequately and in accordance with company policies and procedures
- check that restraint devices provided are serviceable and not worn, cut, torn or otherwise damaged

Security of items inside containers

The type and composition of the cargo carried will determine the most appropriate means of restraint. Some commonly used restraint devices and their uses are described below.

Lashings and tethers

Lashings and tethers can be made from straps, rope, cable or chain. They should be purpose designed for restraining cargo and bear international or national standard markings indicating their performance rating. Lashings and tethers should be appropriately arranged so that the goods restrained will be unable to break free if a ship or vehicle should pitch.

Knots and twists can reduce their effectiveness. Dampness can reduce the breaking strength of lashings and tethers made from natural fibres.

Dunnage\(^5\) – materials used to prevent cargo moving during transit such as cardboard, empty pallets, scrap wood, polystyrene blocks, air pillows etc.
Cargo should be lashed or tethered as low down in the container as possible, using approved anchorage points. The strength of the anchorage points should be equal to or exceed that of the tether to ensure the robustness of the entire restraint system.

Lashing over the top of a load is generally the least-risk method for load restraint. However, due to the variety of cargo items and restraint devices available there is no ‘one size fits all’ solution to securing a load safely. Reasonableness and practicality also have their parts to play.

**Netting**

Nets may be used in containers to separate items and provide a degree of restraint. These should typically incorporate webbing straps and be fitted with tensioning devices and preferably snap hooks that will prevent them coming detached from anchorage points.

The net mesh should be smaller than the smallest cargo item to be restrained. Awareness of the possible extent to which the net may stretch if the load slips may be a factor in whether or not netting is used in a particular situation.

Netting should be fixed down to as many approved anchor points in the container as possible. As with lashings and tethers, nets should be used to restrain cargo as low down as possible. Netting should be used where the item(s) is of an unusual or awkward shape or fragile and therefore cannot be easily restrained using straps.

**Other restraining devices**

There is a wide variety of additional devices available to restrain cargo including partitioning, racking, shoring poles and dunnage.

**Conclusions and recommendations**

Recent incidents involving shipping such as those mentioned at the start of this briefing note have pushed the whole issue of safe loading of containers into the limelight especially given the interest shown by the Maritime and Coastguard Agency (MCA). FTA believes that the obstacles and difficulties outlined in this paper must be tackled for reasons of safety and urges its members to encourage their supply chain partners to adopt maritime rather than road-going standards when consignments involve the use of containers or ro-ro ferries. If this practice was adopted there would likely be fewer incidents to jeopardise the day-to-day activities of truck or train operators.

Routine weighing of containers needs to be built into supply chain procedures wherever possible. The necessary guidance is already in place. UK industry does not want additional burden imposed upon it either by national or European legislation.

FTA has learnt that some national authorities are considering or have already implemented, sanctions that penalise shippers or forwarders whom they consider are really responsible for overloaded HGVs. The Association is also aware that some countries are planning to impose huge fines on shipping lines whose vessels lose containers overboard in coastal waters. The International Maritime Organisation (IMO) is considering revision of its safety/security guidelines and it is not yet known how the liabilities of the various parties may be affected in future.
Thanks are due to Maersk Line and the Maritime and Coastguard Agency for advice/photographs included in this briefing note.